

2.1 Modeling Quadratics Relations

1. ACTIVITY

Plot the points and draw the graph for each of the relations below.

x	y
4	-3
5	0
6	3
7	6
8	9

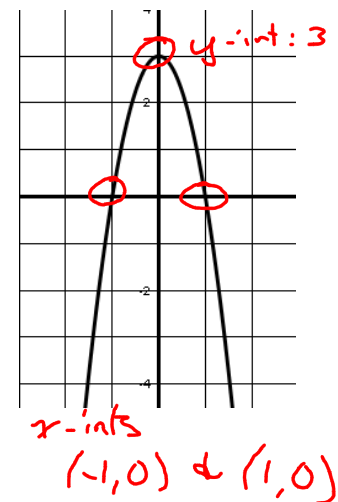
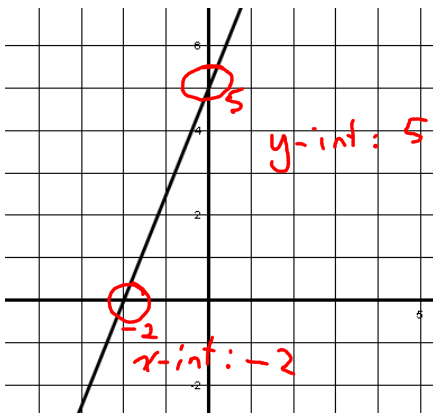
Linear

x	y
-1	-3
0	-4
1	-3
2	0
3	5

Quadratic

Use Desmos to plot the points and then sketch what you see

2. State the x and y intercepts



3. LINEAR VS QUADRATIC

- The graph of a Linear Equation

is a straight line

- The Graph of a Quadratic Equation

is a curve (symmetrical)

4. 1st & 2nd DIFFERENCES

- 1st differences: for evenly spaced x values, find the difference between consecutive y values
- 2nd differences: determine the difference between consecutive 1st differences


x	y	1st Differences
-3	7	$4 - 7 = -3$
-1	4	$1 - 4 = -3$
1	1	$-2 - 1 = -3$
3	-2	$-5 - (-2) = -3$
5	-5	$-8 - (-5) = -3$
7	-8	

straight line

x	y	1st Differences	2nd Differences
-3	0	-1	
-2	-1	1	2
-1	0	3	2
0	3	5	2
1	8	7	2
2	15		

- Quadratic
- Will make a parabola

DEFINITIONS

- Parabola: symmetrical U shaped curve that opens up or down;
graph of a quadratic relation 
- Vertex: lowest or highest point on a parabola that opens up or down
- Minimum: lowest point on a parabola that opens up
- Maximum: highest point on a parabola that opens down

LINEAR OR QUADRATIC? HOW TO TELL

- If the graph is a parabola → quadratic
- If 1st differences are constant → linear
- If 2nd differences are constant → quadratic
- If the degree of the polynomial is 1 (has x term only) → linear
- If the degree of the polynomial is 2 (has x^2 term) → quadratic

For each example, identify whether it is **linear** or **quadratic**.

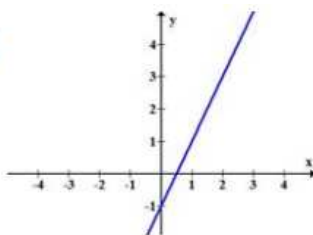
a) $y = -2(x + 1)^2 + 1$

QUADRATIC

b) $2x - y + 7 = 0$

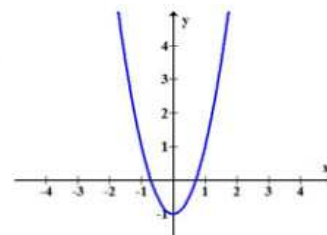
LINEAR

c)



LINEAR

d)



QUADRATIC

APPLICATION PROBLEM

A football was thrown in the air. Its path can be modelled by the relation $h = -5t^2 + 20t + 1.5$ where h is the height of the football in metres and t is the time in seconds.

a) Complete the table of values and graph the relation.

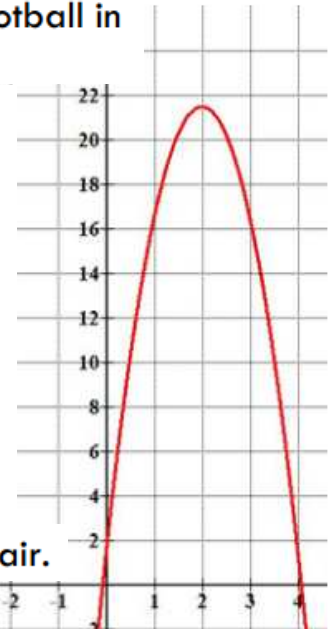
t	h
0	1.5
1	16.5
2	21.5
3	16.5
4	1.5
5	-23.5

$$h = -5(0)^2 + 20(0) + 1.5$$

$$h = -5(1)^2 + 20(1) + 1.5$$

$$h = -5(2)^2 + 20(2) + 1.5$$

⋮ ⋮



b) Use your graph to estimate how long the ball was in the air.

about 4 seconds

c) Use your graph to estimate the coordinates of the vertex of the relation. Explain the meaning of the coordinates of the vertex in this context.

The max height of the football is at $(2, 21.5)$
 time = 2 sec
 MAX height = 21.5 m

d) Explain the meaning of the data in the first row of the table.

Ball was thrown from a height of 1.5 m

Station activities

Practice

p 166 # 4 - 7 bd, 10 bc, 11, 12

p 232 # 2bd, 7ab, 12

Homework
p. 174 # 2-6
p. 177 # 7, 10